SHORT REPORT

Effect of suckling on the peripheral sensitivity of full-term newborn infants

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Background: Sucking may reduce the manifestations of pain in newborn infants.
Objective: To examine the effect of suckling on the threshold for peripheral somatosensory responses.
Subjects and methods: Graded Von Frey filaments were applied to the heel to initiate peripheral somatosensory responses (withdrawal reflex and gross body movements) in term infants.
Results: Dummy sucking increases the somatosensory threshold, but breast feeding had a more marked effect, increasing the threshold of the flexion withdrawal reflex ($p \leqslant 0.002$) and the threshold for gross body movements ($p \leqslant 0.002$).
Conclusion: Peripheral sensitivity of newborn infants is considerably reduced during sucking, particularly at the breast.

Although pain perception is a central phenomenon, it usually arises peripherally. Changes in peripheral sensitivity may be important in pain management. The responses of the newborn infant to peripheral stimulation are many and varied. They are thought to be protective—either directly (eg, the flexion withdrawal reflex)[1] or indirectly (by signalling to the care giver). Newborn responses are related to both the type of stimulus and the maturity of the infant—more mature infants have a greater repertoire of possible responses. We have shown that increasing the application of force of peripheral somatosensory stimulation leads to a progression of responses, the thresholds of which vary with the maturity of the infant. We have investigated how suckling influences the threshold to such peripheral stimulation by Von Frey filaments.

MATERIALS AND METHOD

We attempted to recruit a convenience sample of 20 full-term healthy infants per experiment from in-patients in the Simpson Centre for Reproductive Health, Edinburgh, UK. Infants with congenital anomalies and those receiving analgesics were excluded from the study. Graded Von Frey filaments were used to stimulate the skin of the heel until a clear withdrawal of the limb was seen (which was considered as the flexion withdrawal reflex threshold). Then, higher forces were applied until gross body movements (which include movements of the head and the trunk) were seen. Three experiments were carried out: (1) infants were tested lying supine, and lying supine sucking a dummy; (2) infants were tested in the kangaroo position in the mother's arms and then suckling at the mother's breast; (3) infants were tested in their mother's arms, sucking a dummy and then suckling at the breast. The interval between interventions was sufficient to prevent habituation of response between interventions.

The study had sanction from the local research ethics committee and written consent from parents, who were present during the testing. Statistics were performed using SPSS V.10.5, groups being compared by paired t test.

RESULTS

Experiment 1: Dummy sucking

Nineteen healthy full-term infants, 39.5 (standard deviation (SD) 1.5) weeks gestation (none of whom had had heel pricks), were tested at postnatal age 1.5 (SD 0.83) days with graded Von Frey filaments on either the right or the left heel on two occasions, firstly while lying supine and secondly while lying supine and sucking a dummy. Sucking significantly increased the threshold at which both the flexion withdrawal reflex ($p = 0.042$) and the occurrence of gross body movements ($p = 0.027$) were elicited. The experiment on an additional baby was abandoned at the mother's request during testing.

Experiment 2: Breast suckling

Twenty healthy full-term infants, 40 (SD 1.17) weeks gestation and of postnatal age 2.2 (SD 0.95) days, who had never had a heel prick, were tested with Von Frey filaments first while they were in a Kangaroo position in their mother's arms and then while breast feeding. Suckling at the breast significantly increased the threshold at which both elicitation of the flexion withdrawal reflex ($p<0.001$) and manifestation of gross body movements ($p<0.001$) occurred.

Experiment 3: Comparison of dummy and breast suckling

Twelve full-term infants, 39.5 (SD 1.89) weeks gestation, who had had 4.6 (SD 7.3) heel pricks and were at postnatal age 4.5 (SD 2.0) days, were examined with Von Frey filaments, first while they were sucking a dummy and then while they were breast feeding. Figure 1 shows that suckling at the breast increased the threshold at which both elicitation of the flexion withdrawal reflex ($p = 0.002$) and manifestation of gross body movements ($p = 0.002$) occurred compared with sucking a dummy. Recruitment problems related to dummy sucking in breast-fed infants curtailed the numbers in the experiment.

DISCUSSION

All infants have a potentially painful heel prick for the metabolic screen in the first week of life, and certain infants may need blood sampling recurrently if predisposed to hypoglycaemia or if jaundiced. Although pharmacological measures such as sucrose effectively reduce the pain,[3] in the clinic or postnatal ward a behavioural manoeuvre would have advantages. Our experiments show that sucking decreases the peripheral sensitivity to heel stimulation, and, although this is not painful in itself, there is evidence that such somatosensory stimulation uses the same pathways as painful stimulation from a heel prick.[4] Our results would suggest that any sucking is better than none, but suckling at the breast, possibly because of associated endorphin release, is superior at reducing the sensitivity (increasing the threshold).[5]

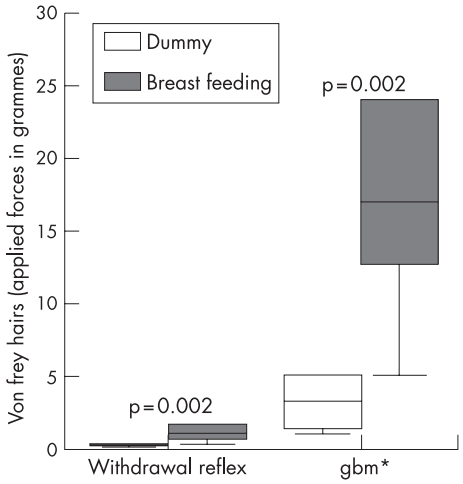

Figure 1 Threshold for flexion withdrawal reflex and gross body movements (gbm) in full-term infants during dummy sucking and then during breast feeding. Box = 25th–75th centile, whiskers 10th centile.

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